CME

Clumsy children

Primer on developmental coordination disorder

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SUMMARY

The common assumption that children "grow out of" clumsiness is not supported by studies carried out over the last 15 years. About 6% of children lack the motor coordination to perform age-appropriate tasks. Greater awareness of this developmental coordination disorder will improve the rate of identification. Family physicians should incorporate questions about motor skills into their assessments of preschool children.

RÉSUMÉ

Les études effectuées au cours des 15 dernières années ne supportent pas l'hypothèse courante voulant que le développement des enfants se fait à partir de leurs maladresses. Environ 6 % des enfants n'ont pas développé une coordination motrice suffisante pour exécuter les tâches appropriées à leur âge. Une plus grande sensibilisation à ce trouble du développement de la coordination améliorera le taux d'identification. Le questionnaire des médecins de famille qui évaluent les enfants d'âge préscolaire devrait inclure des questions sur le développement des habiletés motrices.

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SHORTLY AFTER HIS FIFTH BIRTHday, Jeremy's mother came to her family doctor with concerns about Jeremy's poor motor skills. She had been a patient for several years, having joined the practice when she married her husband, whose parents and siblings had been patients for many years.

Jeremy's mother had noticed that Jeremy was clumsy in using scissors and cutlery and had difficulty climbing stairs one foot after another in comparison with the kindergarten children she had taught before having her own children. She had mentioned these concerns to the pediatrician who had attended Jeremy since birth. At checkups at age 3 ½ and 5 years, the pediatrician told her there was nothing to be concerned about because there were no abnormal physical findings and muscle tone and strength were normal.

Jeremy's family doctor recommended assessment at the local specialized treatment centre for children. One year later, Jeremy's mother reported on his progress with satisfaction. After the assessment, Jeremy had received weekly guidance from an occupational therapist who visited him at his school. At home, his mother supervised him in the daily exercises recommended by the therapist. His teacher, who initially interpreted his frequent falls and obvious clumsiness as an attention-seeking maneuver, now appreciated his difficulties.

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Discussion

Jeremy's presenting problem is developmental coordination disorder (DCD), a common condition that can seriously affect the lives of children and their families. The disorder has been unfamiliar to family physicians and pediatricians. Long recognized by neurologists[1] and well described in the occupational and physical therapy literature, the DSM-IV[2] describes DCD as the motor awkwardness displayed

by a child of normal intelligence and free of neurologic disease who lacks the motor coordination necessary to perform age-appropriate motor tasks.

Parents and teachers of children with DCD recognize the problems they encounter in their physical interactions with the world around them. Many parents report that their children have trouble learning the physical skills that other children acquire almost without effort in their first few years: managing tools, such as crayons, scissors, or cutlery; throwing and kicking balls; and tying shoes and fastening buttons. However, many physicians are unaware of the effects of DCD and downplay parents' concerns. Seeing the difficulty these children display in crafts and artwork, during meals, or in the playground, schoolteachers increasingly encourage parents to seek medical advice.

Because difficulties are experienced in a variety of tasks in different situations throughout the day, many children come to expect failure; their lower self-confidence can weaken their social, academic, and physical performance. Seeing their children's struggles and grief, parents often feel confused when professionals minimize the importance of the problem.

How children are affected

Results of prevalence studies vary according to the operational definition, the identification process chosen, the care taken in differential diagnosis, and the underlying differences in populations. Obvious physical and sensory disabilities and mental retardation should be excluded because poor motor skills could simply reflect cognitive impairment. Even after excluding other conditions, childhood prevalence estimates are staggeringly high, ranging from 5% to 15%,[3-8] with the figure of 6% quoted in DSM-IV[2] and widely accepted. Boys are more commonly affected.

Diagnosis is difficult in the first year of life, but becomes increasingly obvious as expectations for complex motor skills increase. Teachers often recognize problems to which parents have adapted, and difficulties in handwriting sometimes signal previously unremarked problems.

The assumption that children "grow out of" clumsiness, widely held by physicians, has not been sustained by the last 15 years of longitudinal research. Strong scientific evidence now shows that most children's motor problems persist well into adolescence and that the affected children tend to "grow into" a host of comorbidities. Methodologically sound longitudinal studies[9-12] draw attention to the increased likelihood that affected children will display poor social competence,[13] poor motivation, low self-esteem,[14] unhappiness, and reluctance to engage in physical activities with consequently poor physical fitness.

While the nature of the relationship between clumsiness and academic learning difficulties[15,16] is uncertain (learning disabilities, with a prevalence of 10% to 15%, often simply coexist with poor motor coordination without necessarily being caused by the same underlying mechanism, and clumsiness might cause academic difficulties in written work[17]), there is no doubt that many clumsy children experience serious problems in school. The relationship between specific developmental dysgraphia[18] (writing disorder) and DCD needs clarification. Speech disorders could reflect an underlying motor coordination problem, but additional language and communication disorders are overrepresented and might share a common underlying mechanism.[19] Attention deficit disorder, with or without hyperactivity, is another common concomitant of academic underachievement. It occurs in about half of all clumsy children.

Persisting coordination difficulties and neurologic signs suggesting neuro-maturational delay have long been recognized as predictive of psychiatric disorders. So-called soft neurologic signs[20] with poor motor coordination at age 7 predict affective and anxiety disorders at age 17.[21] A longitudinal follow-up to age 16 of children identified at age 6 with deficits in attention, motor control, and perception[22] showed nearly 60% had psychiatric and personality disorders in midadolescence, 13% were substance

abusers, and 5% had attempted suicide. For most children, poor motor coordination will be a persistent problem likely to be associated with difficulties in mood, behaviour, relationships, and academic performance.

How can doctors recognize DCD?

Faced with children who cannot perform age-appropriate self-care, academic, or recreational tasks, as reported by parents or teachers, family physicians must determine whether the children's difficulties are due to DCD or not.

Traditional neurologic examination is largely unhelpful; abnormalities in the cranial nerves, muscle tone or power, sensation, deep tendon reflexes, or plantar responses are not typically associated with DCD and suggest the need for further investigation or consultation.

Diagnosis of DCD can be confirmed using quantitative neurologic examinations.[23-27] Standardized tests,[28-30] which explore children's motor competence in a variety of domains, are usually administered by occupational therapists and can be used to estimate severity and response to intervention. History elicited from parents is likely to be more eloquent than any examination.

Stories told by parents and children suggest difficulty or delay in acquiring skills, such as the ability to dress independently, including knots and buttons; to feed themselves, including cutting with knives and pouring liquids; to look after washroom hygiene; to use crayons or pencils in prewriting play; to use tools; to kick and catch balls; to run, ride a bicycle, and skate. All these skills are influenced by cultural and family expectations and, although norms are available, individuals vary widely. Clumsiness can be generalized, restricted to groups of somewhat similar tasks, or highly task specific (many children use tools proficiently but are unable to write with acceptable speed or neatness).

It is not the delay itself but the extreme difficulty and distress experienced by these children in trying to master the skills that differentiates them from their peers. Persistent patterns of task avoidance are characteristic: children tend to be labeled "lazy" or "immature" despite evidence that in other activities they are neither. If the tasks are learned, they tend to be performed very slowly and inconsistently. Physicians must listen to parents and elicit clues: hours spent daily unsuccessfully trying to teach buttering bread or tying shoelaces; tearful opposition to learning to ride a bicycle or skate; temper tantrums provoked by simple pencil and paper tasks; bright, articulate students failing because of incomplete or untidy written assignments; dawdling and despair because of failure to button jeans or fit a key in a lock.

A recent authoritative, international, multidisciplinary consensus statement[31] noted that people with DCD display qualitative differences in movement that differentiate them from those of the same age without DCD. These qualitative differences change with maturity, but they tend to continue throughout life in some form. Some findings can be objectified in quantitative measurements, including timing and accuracy of movements. Family physicians should suspect DCD even when classic neurologic examination results are normal. If possible, children should be observed attempting the tasks that cause them difficulty. The index of suspicion should be high, because DCD is more common than any of the conditions to be excluded in differential diagnosis.

Differential diagnosis

Many neurologic conditions can present as poor coordination.[18,32] Differential diagnoses must be considered at each level of organization of the entire neuromuscular system, but usually the history and standard physical examination are sufficient. Developmental history might require validation with a "baby-book" or child health record. This often aids parents to recall almost forgotten slow motor learning experiences. A detailed family history might reveal other members with coordination or learning difficulties or other neurologic disorders.

It is important to ask about loss of skills once acquired. Such loss should lead to consideration of investigation for neurodegenerative disorders.

Physicians should consider the possibility of other neurologic conditions, including mild mental retardation, which is frequently not recognized until the early school years. Clumsiness is often found among low birth weight survivors, and a history of mild closed head injury might be important. Hyperactive behaviour could lead to a diagnosis of attention deficit disorder, which might itself be responsible for some clumsiness. The motor performance of children with attention deficit disorder usually improves once the child's attention is focused on the task (children with DCD appear to concentrate intensely while achieving nothing).

Café au lait spots and other specific skin lesions sometimes indicate neurofibromatosis or related disorders. The early stages of muscular dystrophy can present as clumsiness; mild weakness might be apparent in DCD, but muscle wasting requires investigation. Normal resting muscle tone and deep tendon reflexes usually exclude major static encephalopathy, such as cerebral palsy; arrested hydrocephalus is suggested by large head size. Lateralizing signs are not seen in DCD, although lateral preference (handedness) might be poorly expressed or the nondominant upper limb very poorly coordinated indeed. Difficulties with tasks involving both hands, or both sides of the body, might be marked. Obvious cerebellar signs are unusual in DCD. In general, when the history suggests DCD, no neuroimaging or other investigations are indicated.

Family physicians are well placed to find out whether general medical conditions, such as hearing loss, visual impairment, effects of drugs and toxic substances, thyroid malfunction, short stature, anemia, and all conditions reducing effort tolerance, are contributing to clumsiness. The possibility that a child has been seriously deprived of learning experiences also should be considered.

Comprehensive diagnosis must include a search for comorbidities, particularly mood, attention, behavioural, and learning disorders. Family physicians assessing clumsy children over time should periodically review school performance, social competence, and the possibility of emotional or conduct disorders, through parent and teacher reports and communication with children themselves. When children are diagnosed with DCD, physicians must have a very high index of suspicion for future psychiatric or learning disorders. Advising parents or teachers that questionable behaviours are "probably normal" or will be outgrown is likely to be wrong.

How are families affected?

Families of children with DCD often share the children's frustration.[33] Typically, parents report that their concerns have been ignored by their doctors or that they have been inaccurately reassured of improvement and now blame themselves for doing nothing. Teachers are often perceived as blaming parents either for not insisting on better motor performance or for their failure to have the child diagnosed and treated. Inevitably some parents experience guilt, and many are angry that they cannot influence the education or health care systems to help their children.

Parents sometimes become overprotective and come to share their children's feeling that the world is essentially hostile. Mothers and fathers commonly perceive their children's difficulties differently with resulting discrepancies in child-rearing practices and relationships with the children, which can feed back into existing marital dysfunction.

Management

Family physicians can use routine visits as opportunities to discuss with parents children's performance of age-appropriate tasks. With better understanding of the main features of DCD, family physicians will be able to identify it more often. Once DCD is correctly identified, families are relieved of the anxiety that "something worse" is present, children can be told they are not "dumb" and will not be "blamed" for the problem, and teachers can be told children are not lazy or defiant. Early identification reduces the likelihood of learned helplessness with resulting poor motivation and despondence.

If the diagnosis is uncertain, consultation with a neurologist or developmental pediatrician

might help, the former particularly when a progressive disorder must be excluded, the latter when assessment of comorbid behaviour or learning disorders and a treatment plan are required.

Education

After diagnosis, the family and school must be educated as to the nature of the condition: that it is a long-lasting but not life-threatening deficiency in poorly understood systems responsible for various aspects of motor performance; that it cannot be cured; that neither surgery nor drugs will help, although stimulant medication might help in some cases of properly diagnosed comorbid attention deficit disorder.[34]

The better informed the family, the less likely the child is to become involved in unorthodox therapies or pathologic "shopping around." A few children grow out of the problem. The condition never gets worse, but motor learning often continues to be an area of weakness. Some motor skills are never learned; others are learned but always performed badly. Learning could be painful for the child, and simple repetition is unlikely to be of benefit. The problems are not due to lack of effort or intelligence, poor parenting, allergies, or active brain disease. Many families are helped by contact with parent support groups concerned with learning disabilities or, if available, DCD itself.[35]

Changing attitudes

Modified expectations and increased understanding can work wonders for children's self-esteem: use of self-gripping fasteners rather than knots or buttons, not insisting on use of knives, encouraging a child's own choice of printing or cursive writing, and de-emphasizing competitive leisure activities demanding strong motor skills in favour of activities in which children compete against their own prior records. If children's conditions are accepted, they will be spared the distress that accompanies unrewarding and unsuccessful repetitive effort.

Children need to rediscover joy in the performance of their bodies: dance, karate, horseback riding, archery, and weight and endurance training have helped some children. Physical education should emphasize fitness rather than athletic skills. Children with DCD are entitled to the same modifications of school programs as other physically disabled students.[36] If slow or untidy handwriting has caused academic failure or distress, the school must be persuaded to allow more time for written assignments and reduced assignment length. Other strategies include providing handouts rather than insisting on copying from the board, help with note-taking, and encouraging keyboarding for longer assignments.

Interventions

Parents and teachers, as well as children, seek in vain for interventions to cure or alleviate DCD. Physical and occupational therapy is often recommended, particularly by teachers, despite limited evidence of efficacy. Several recent methodologically sound research studies have demonstrated small or nonexistent gains after various intensive therapies (sensory integration,[37] perceptual motor,[38] and process-oriented[39] techniques). One study[40] suggested that the slight gain in development of movement skills recorded was due to an increase in self-confidence and willingness to participate in motor activities.

Conventional intervention theories have assumed the existence of prerequisite skills without which more complex skills could not emerge and have emphasized the importance of practising such prerequisites. While practice makes perfect, repeated inaccurate and ineffective performance of motor tasks without feedback or coaching ensures boredom and despondency rather than motor learning. Family physicians should be alert for situations where the demands of therapy are unwelcome to the child and seem to detract from classroom attendance.

Nonetheless, intensively teaching specific tasks might result in improvement,[41] and the use of verbal self-guidance[42] on tasks of the child's own choice in a case control study resulted in improvement with some indications of generalization to tasks for which the child is less motivated.

Occupational therapists can quantify the disability; advocate for relevant modifications in the

child's environment (including changed expectations); assist in providing information to parents, teachers, and children; and assess whether children would benefit from intervention techniques. Therapists can offer children informed and individualized one-on-one encouragement and mentoring for a range of motor activities related to school work, leisure, and activities of daily living.

Research has shown that many children with DCD have psychiatric disorders in adolescence. We do not know how much these problems relate to their frustration in learning new tasks, or their parents', teachers', or health professionals' lack of understanding of their motor difficulties, rather than to common underlying neuropathology.

Conclusion

Developmental coordination disorder is a common and usually permanent condition that seriously interferes with the well-being of patients and their families. There are strong associations with learning disabilities and with psychiatric disorders in adolescence. Family physicians and pediatricians frequently do not recognize DCD or dismiss it as transient and unimportant. Family physicians have an important role in diagnosis and early intervention, referral for assessment and interventions when appropriate, information exchange with families and teachers, and ongoing family support. ■

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